

## **REPORT DOCUMENTATION PAGE**

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1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (From - To)		
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15. SUBJECT TERMS				
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a. REPORT	b. ABSTRACT	c. THIS PAGE		Leilani Richardson
Unclassified	Unclassified	Unclassified	A	19b. TELEPHONE NUMBER (include area code) (661) 275-5015

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**15. SUBJECT TERMS**

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT 	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Leilani Richardson
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MEMORANDUM FOR PRS (In-House Publication)

FROM: PROI (STINFO)

14 May 2001

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-VG-2001-118**  
C.T. Liu, "Monitoring Initiation and Growth of Crack in a Particulate composite Material Using  
Nondestructive Testing Techniques"

**2001 Society for Experimental Mechanics Conf.**  
**(Portland, OR, 4-6 Jun3 2001) (Deadline 25 May 2001)**

**(Statement A)**

1. This request has been reviewed by the Foreign Disclosure Office for: a.) appropriateness of distribution statement, b.) military/national critical technology, c.) export controls or distribution restrictions, d.) appropriateness for release to a foreign nation, and e.) technical sensitivity and/or economic sensitivity.  
Comments: \_\_\_\_\_  
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Signature \_\_\_\_\_ Date \_\_\_\_\_

2. This request has been reviewed by the Public Affairs Office for: a.) appropriateness for public release and/or b) possible higher headquarters review.  
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3. This request has been reviewed by the STINFO for: a.) changes if approved as amended, b) appropriateness of references, if applicable; and c.) format and completion of meeting clearance form if required  
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4. This request has been reviewed by PR for: a.) technical accuracy, b.) appropriateness for audience, c.) appropriateness of distribution statement, d.) technical sensitivity and economic sensitivity, e.) military/national critical technology, and f.) data rights and patentability  
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APPROVED/APPROVED AS AMENDED/DISAPPROVED

PHILIP A. KESSEL  
Technical Advisor  
Space and Missile Propulsion Division

Date

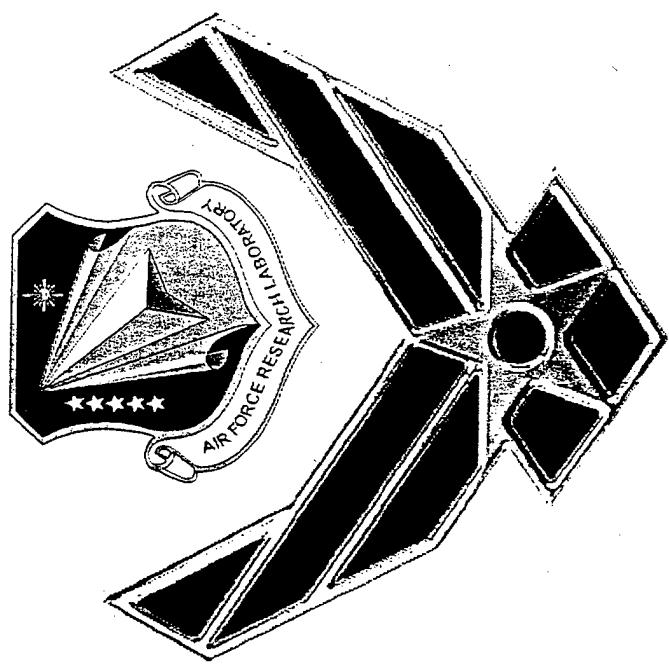
**MONITORING INITIATION AND  
GROWTH OF CRACKS IN A  
PARTICULATE COMPOSITE  
MATERIAL USING  
NONDESTRUCTIVE TESTING  
TECHNIQUES**

C. T. Liu

AIR FORCE RESEARCH LABORATORY

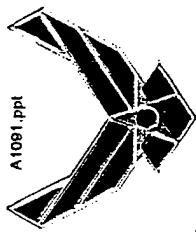
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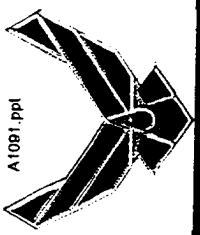
# Objective



- Investigate Damage Initiation and Crack Growth Behavior in a Highly Filled Polymeric Material.

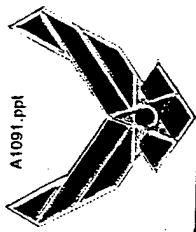


# Conclusions



- Real-time x-ray data reveals that damage rate increases rapidly prior to the formation of a crack.
- During the stable crack growth stage, the damage zone size and the intensity of damage increase with increasing time.
- During the unstable crack growth stage, the damage zone size and the intensity of damage decrease with increasing time.
- The results of strain measurement and numerical analysis reveal that the normal strain increases rapidly prior to the formation of a crack.
- The real-time x-ray technique is a promising technique to monitor damage initiation and evolution processes in the particulate composite material.

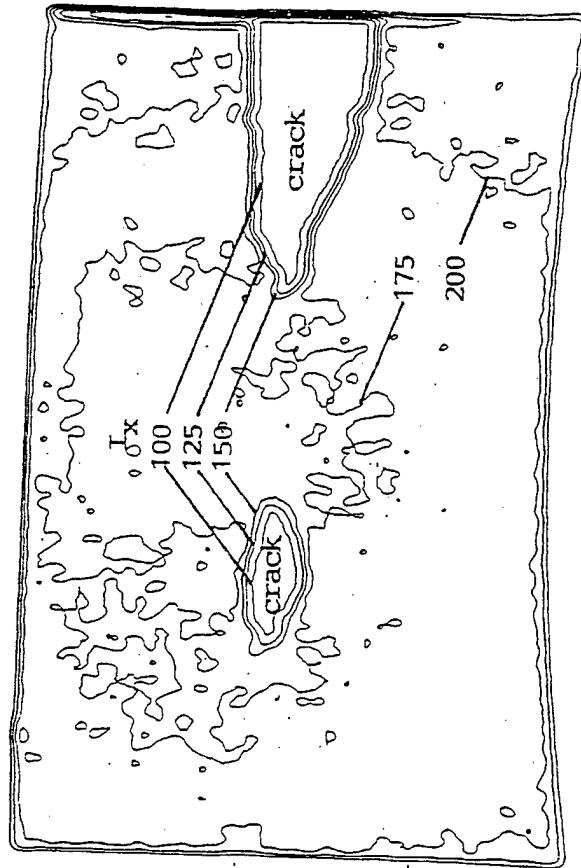
# Iso-Intensity Contours of Transmitted X-Ray Energy $I_x$



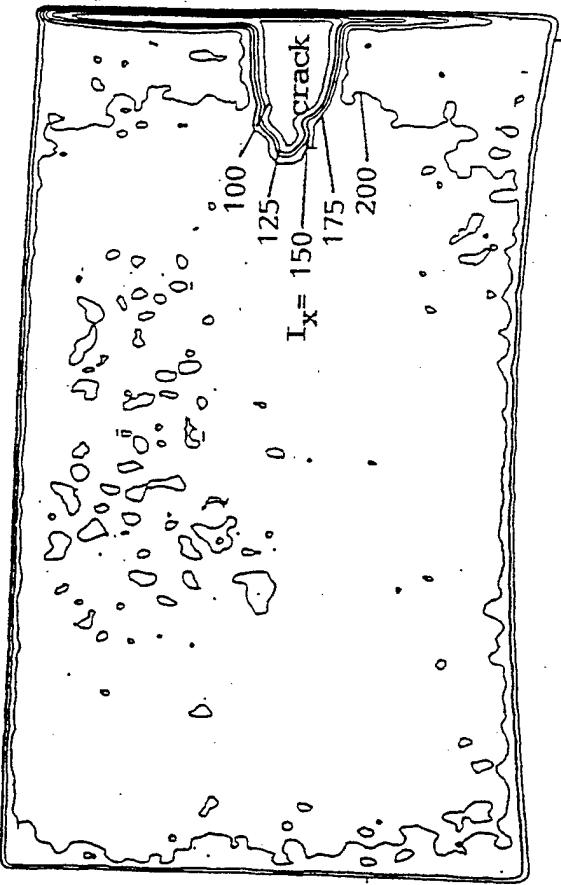
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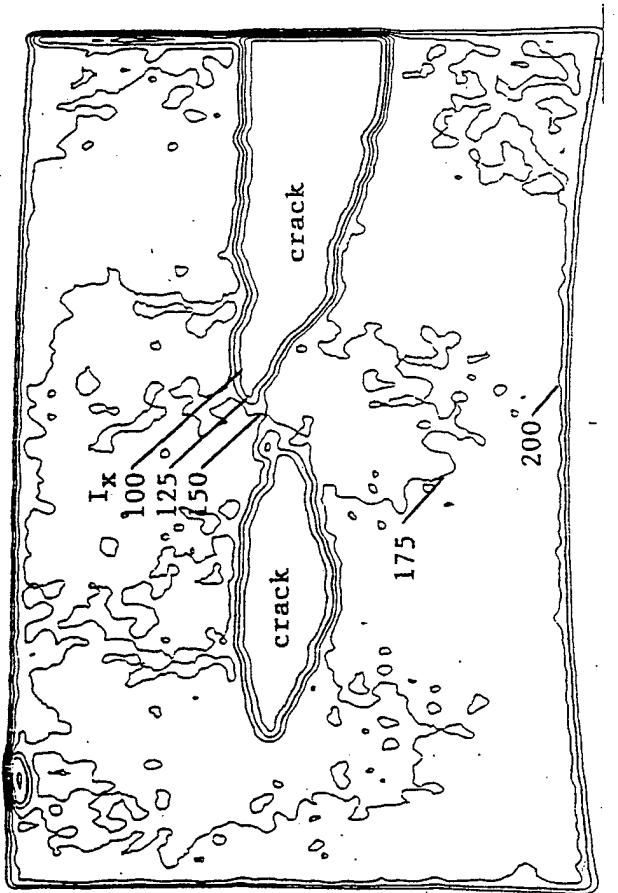
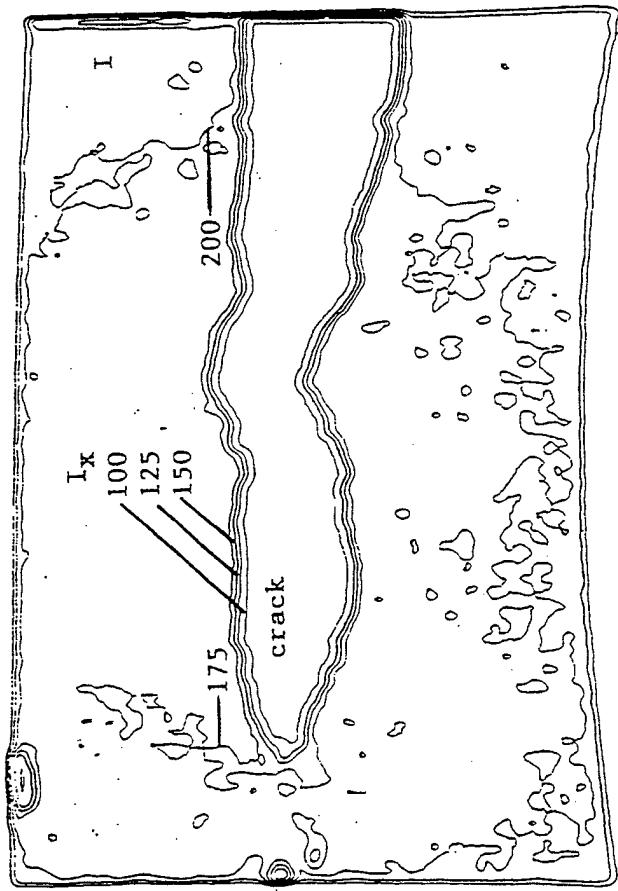
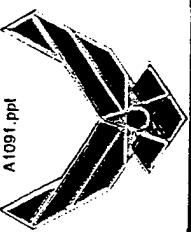


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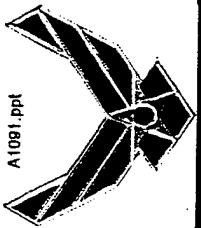
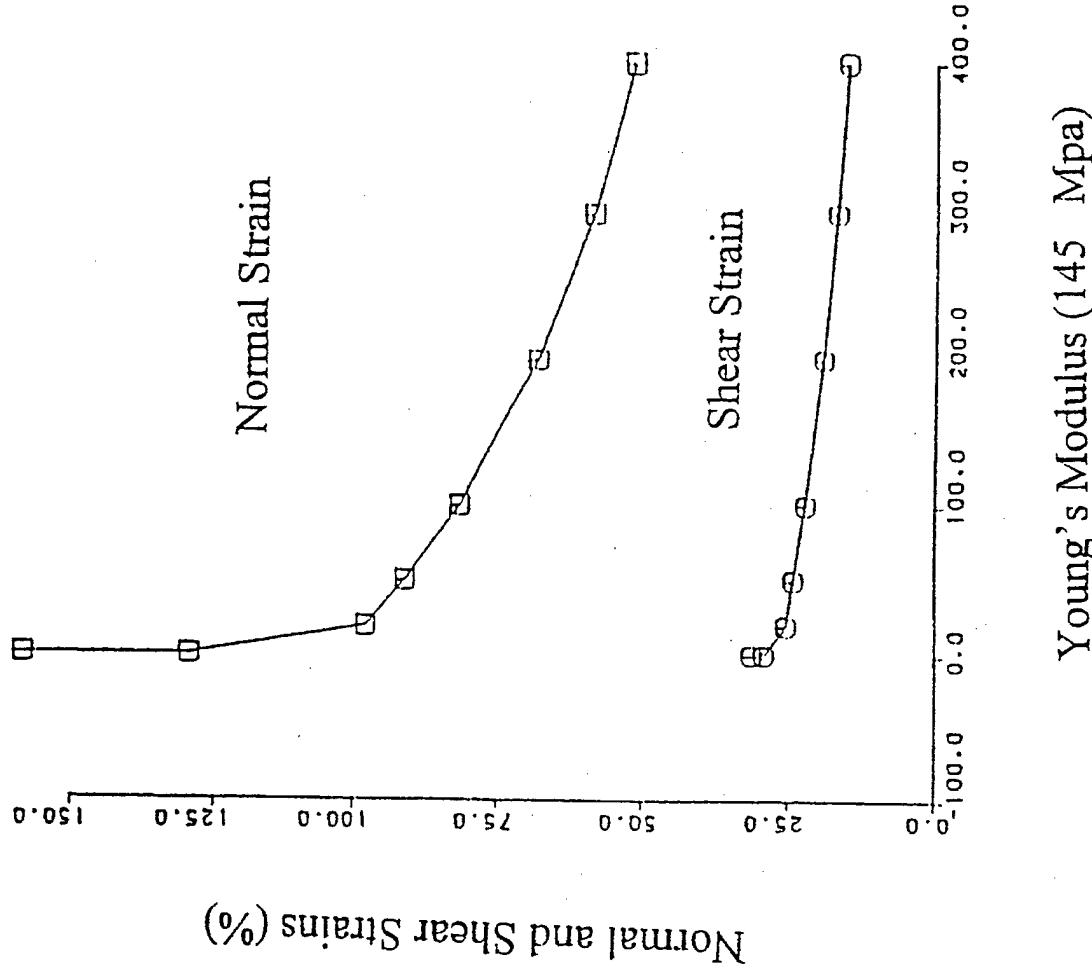


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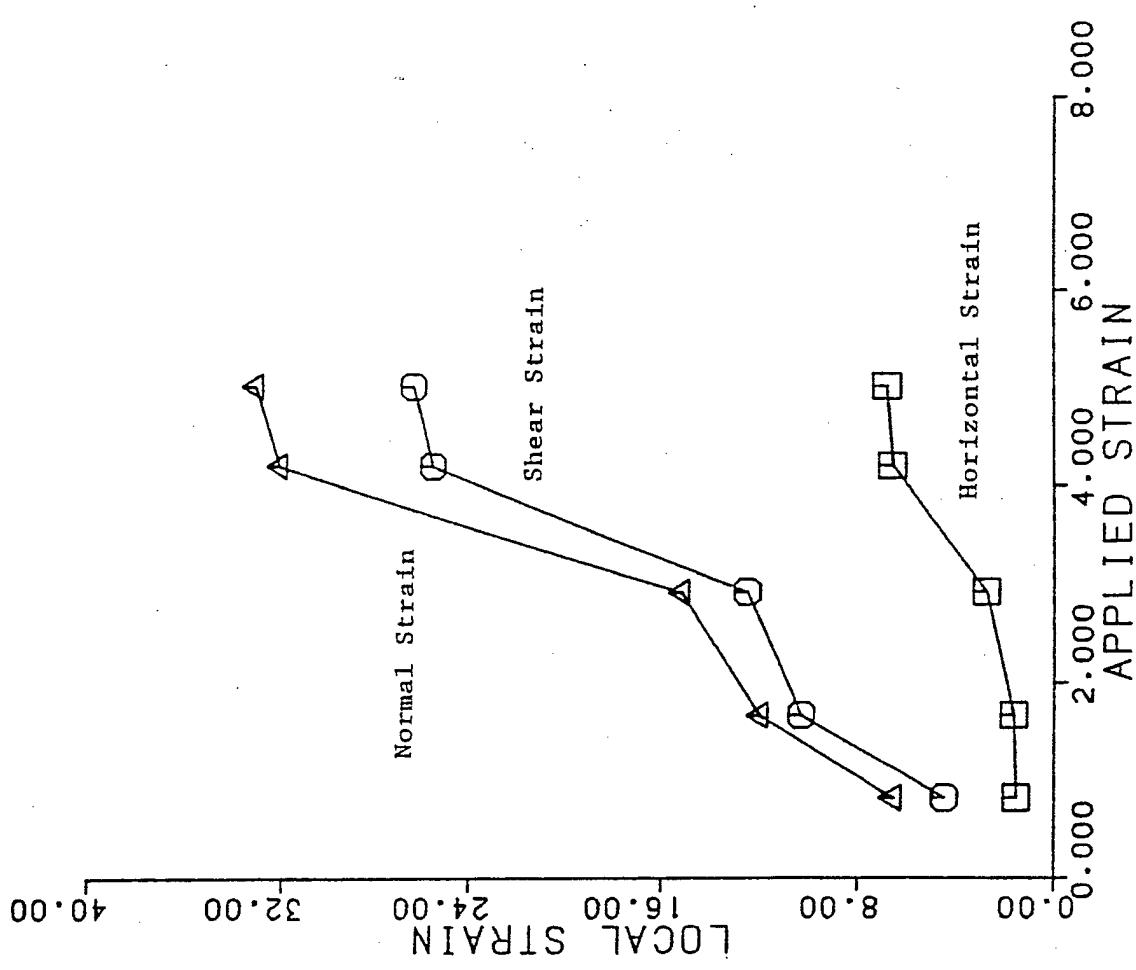
# Iso-Intensity Contours of Transmitted X-Ray Energy $I_x$



# Normal and Shear Strains Versus Young's Modulus



# Local Strain Versus Applied Strain





# X-Ray Intensity $I_x$ Versus Applied Strain

